

EXP #137 BETAS AT F28 WITH THE FIXED-TARGET OPTICS AND AT 800 GeV

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References

1. EXP-120, 6/21/85. 10th Studies.
2. EXP-122, July 5, 1985; EXP-122A, July 9, 1985.

Ref. 1, 10th Studies 1985, 4th paragraph:

"Next we stored the beam at 800 GeV to use the special correction quad at F28 to measure the  $\beta$  function. We made measurements with and without the B $\emptyset$  low  $\beta$  insertion energized. The fixed target optics gave acceptable answers of  $\beta_x = 80 \pm 15$  and  $\beta_y = 15 \pm 15$  but the low  $\beta$  case gave the same screwy  $v$  vs current curves as seen during the last study session."

The analysis of the data with low-beta insertion is given in Ref. 2.

It was reported there that the data can be fitted very well if the linear coupling parameter  $|k|$  is used as one of the unknown quantities. The values of  $\beta_x$  and  $\beta_y$  at F28 and at F34 obtained from the analysis were not what we expect from the design of low-beta insertion:

<u>F28</u>		$\beta_x$	$\beta_y$
	From the data analysis	134.5m	12.4m
	From SYNCH calculation	110.1	29.1
<u>F28</u> *	From the data analysis	141.6m	18.5m
	From SYNCH calculation	111.3	29.4

\* with slightly different values of tunes.

<u>F34</u>	$\beta_x$	$\beta_y$
From the data analysis	152.2m	46.2m
From SYNCH calculation	101.6	30.5

In view of these discrepancies, it was felt that we should get better values of  $\beta$  at F28. Values given in ref. 1,  $80 \pm 15$  and  $15 \pm 15$ , are undoubtedly eye-ball estimates. The analysis is identical to what is explained in ref. 2.

$$v_{x0} = 0.4186, \quad v_{y0} = 0.3760, \quad \boxed{\beta_x = 93.85m, \quad \beta_y = 31.05m}$$

$$\text{coupling parameter } |k| = 0.0213$$

$I_Q(A)$	$v_+$		$v_-$	
	<u>measured</u>	<u>calculated</u>	<u>measured</u>	<u>calculated</u>
-40.2	.4162	.4162	.3685	.3685
-19.4	.4214	.4214	.3680	.3680
-12.7	.4234	.4234	.3679	.3678
0.	.42755	.4274	.3670	.3671
14.1	.4324	.4325	.36635	.3662
21.6	.4354	.4355	.3657	.3657
42.4	.4449	.4449	.3641	.3641

Note: The bandwidth of the frequency analyzer was  $10^{-4}$ .

This is plotted in Fig. 1a and Fig. 1b where dots are the measured points. Each value of tune is the average of lower and upper frequencies as explained in the appendix of EXP-133.

COMMENTS

1. The values of  $\beta$ 's found from this experiment are in almost perfect agreement with the SYNCH table I have (at slightly different tunes,  $v_{x0} = 0.395$  and  $v_{y0} = 0.434$ ):

SYNCH (1.5m downstream of QF28):  $\beta_x = 92.4m, \quad \beta_y = 30.9m$

2. The value for  $|k|$ , the linear coupling parameter, found from this experiment is 14% lower than the one given in EXP-122 (with low-beta optics). This is not really alarming but still somewhat annoying. Although there is no explicit entry in the logbook regarding the setting of  $I_5$ , the correction skew quadrupoles, it is believed to be the same as the one in EXP-122, that is, -2.45 on console which means  $I_5 = -13.1A$  at 800 GeV. This experiment started at 22:40 of May 6th. The logbook says the setting was -2.45 at 07:24 of the same day.

It is gratifying to see this sort of agreement (even though it may be partially accidental) but it would have been much more so if there were similar measurement at F34 giving the same degree of agreement. The need to repeat the measurement of  $\beta$ 's at F28 and at F34 with the low-beta optics remains unchanged.

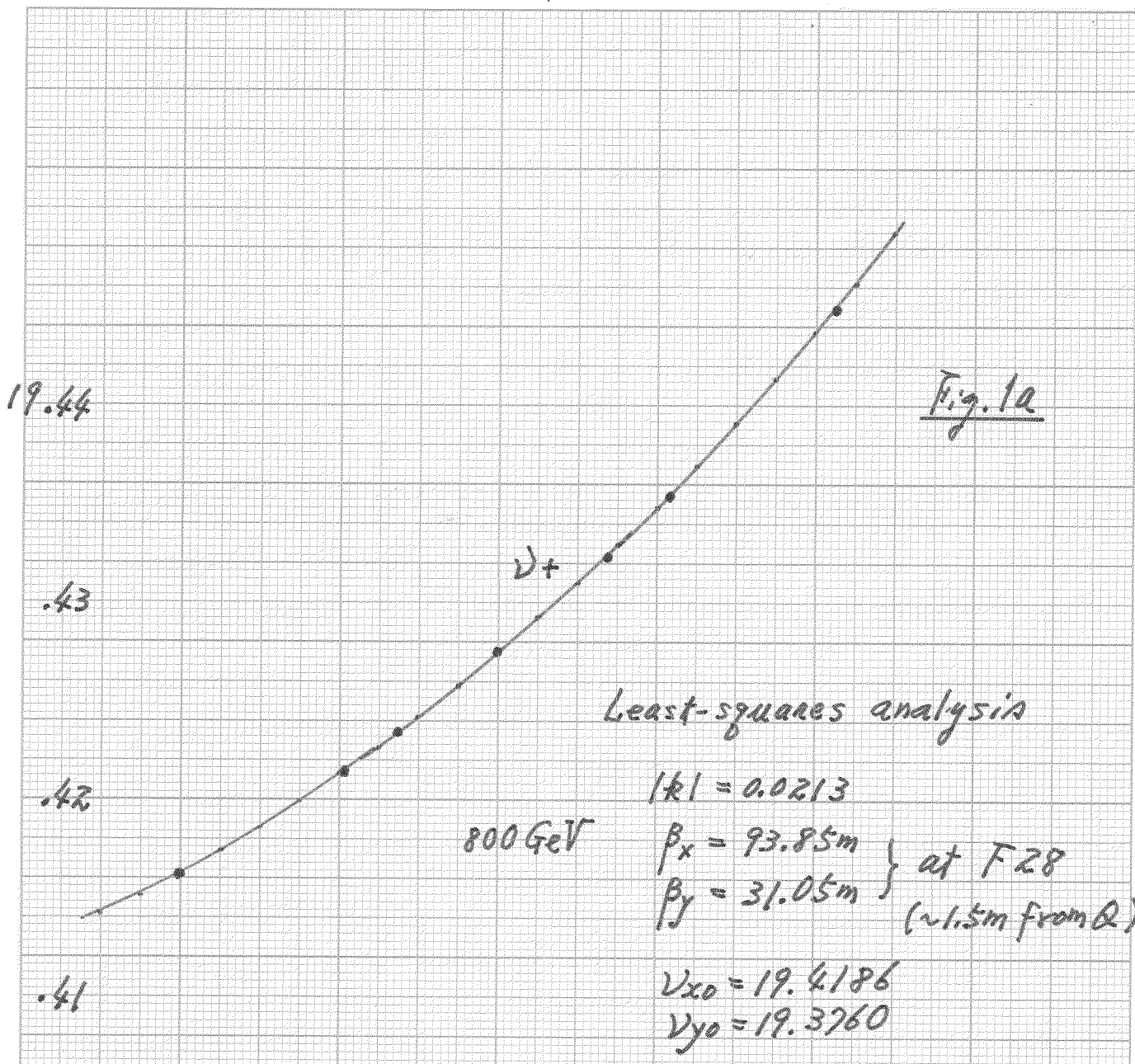


Fig. 1a

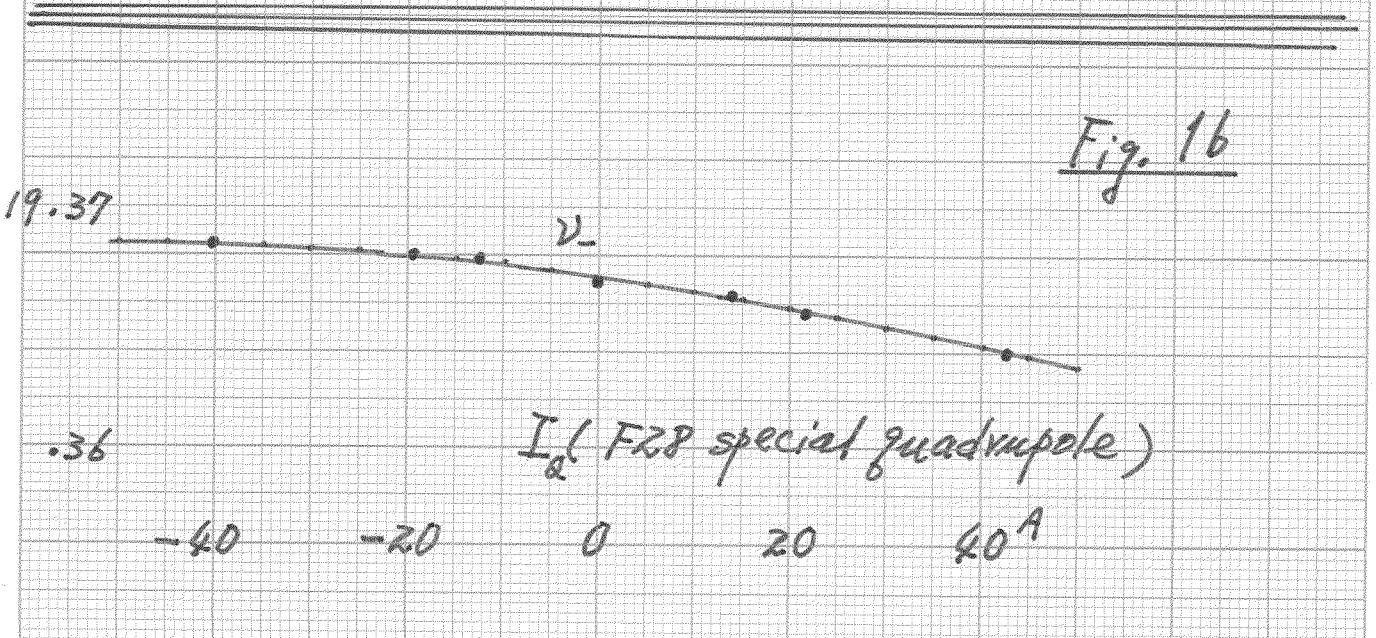


Fig. 1b